Why Are My Fingertips Blue?

Improved Hypoxia Training for Jet Refreshers

By Lt. Anthony Artino and HM1 Stephanie O'Brien

A Hornet was on a high-altitude ferry flight when it descended from 42,000 feet and crashed. The pilot never ejected. Investigators determined the most plausible explanation was pilot hypoxia.

The incident appeared to be caused by a bleed-air leak in the common bleed-air ducting, which resulted in a total bleed-air shutdown, subsequent loss of OBOGS, and loss of cabin pressurization. Those conditions, coupled with a delay in selecting emergency oxygen and a delay in descending, incapacitated the pilot .

Current Hypoxia Training

What are we in naval aviation doing to prepare aviators for the threat of hypoxia? For more than 50 years, aerospace physiologists and aerospace physiology technicians have been providing hypoxia training to Navy and Marine Corps aircrew in the form of low-pressure chamber

training. This training, which hasn't changed significantly in all these years, consists of students listening to physiology lectures and then "riding" a large steel box to a simulated altitude of 25,000 feet. At altitude, students remove their oxygen masks while they play patty-cake and do puzzles, worksheets, or other activities to help them experience and recognize the signs and symptoms of hypoxia.

Although effective, hypoxia training in an altitude chamber does have its drawbacks and limitations. First, refresher students do not perform activities in the context of their working environment: the aircraft. Second, jet students experiencing hypoxia in an altitude chamber do so with their masks off, a fact that may render the training a bit unrealistic in the face of the many recent OBOGS incidents (most of which occurred with oxygen masks in place).

Improved Hypoxia Training

The use of a reduced-oxygen-breathing device (ROBD), combined with actual flight duties, may provide more effective training for jet-refresher students. The ROBD is a portable device that simulates the rarified atmosphere at high altitudes by diluting the inspired oxygen with nitrogen under sea-level conditions.

The advantages of ROBD include:

a. The ability to accurately and reliably induce hypoxia with no risk of decompression sickness, inner ear or sinus trauma.

b. The ability to operate the device almost anywhere, including inside a fleet simulator (this type of training is called simulator-physiology training, or "SimPhys").

c. The ability to induce hypoxia while students wear an oxygen mask and perform actual in-flight duties.

d. The ability to tie together three important aspects present in almost all of the recent in-flight hypoxia incidents:

- The need to recognize aircraft warnings for an oxygen-systems failure
- The need to recognize the signs and symptoms of hypoxia
- The need to execute the proper aircraft-specific emergency procedures to counter the threat

The use of an ROBD is just one part of a larger shift in the traditional physiology and water-survival training paradigm. This new school of thought says aircrew should experience physiological problems in the context of their working environment, not simply listen to lectures about physiological threats. Also, aviators should practice applying effective countermeasures to deal with these physiological threats while immersed in a realistic training environment.

The Road Ahead

The Naval Survival Training Institute (NSTI) provides physiology and water-survival training, and recently has purchased a number of ROBDs. These new training devices have been tested inside a medium fidelity simulator and in FA-18 and EA-6B simulators.

The next time you receive quadrennial physiology and water-survival-training qualification, you may have the opportunity to experience hypoxia while flying in a simulator, instead of playing patty-cake in an altitude chamber.

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ROBD training is scheduled for integration at three ASTCs this summer. A new curriculum (NP-9, hypoxia only) will be available for squadrons as adjunctive training by summer 2005.—Lt. Greg Ostrander, aeromedical analyst, Naval Safety Center.